

# New quantum effect in a two-dimensional electron gas

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We demonstrate that the temperature derivative of the chemical potential of a two-dimensional electron gas (2DEG) exhibits quantized dips where the chemical potential passes through the electron levels of size quantization. We find analytically the shape of the dips accounting for the elastic and inelastic scattering processes in 2DEG. In the limit of no scattering, at zero magnetic field, the dips depend only on the subband quantization number and are independent on material parameters, shape of the confining potential and temperature. The smearing of the dips is a direct measure of the disorder induced smearing of the electronic density of states. This peculiar quantum effect should manifest itself in various optical and electronic transport experiments.

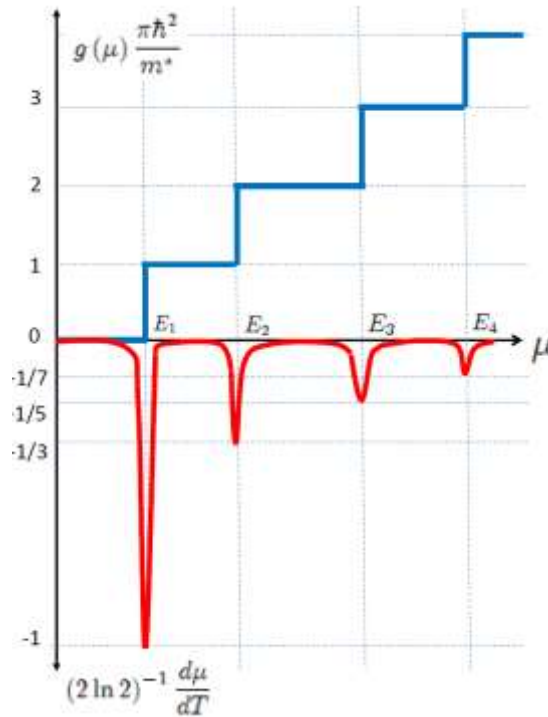


Figure 1. Schematic representation of the dependencies of the electronic density of states (upper panel) and the temperature derivative of the chemical potential (lower panel) as functions of the chemical potential of a 2DEG.